

# Prevention of Medication Errors in a Pakistani Hospital Because of Concurrent Evaluations and Interventions by Pharmacists

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**Abstract: Objective:** The aim of this study is to document different pharmaceutical interventions that took place during dispensing through Computerized Physician Order Entry (CPOE) to prevent medication errors at a multidisciplinary tertiary care hospital in Karachi, Pakistan.

**Method: Study Design:** Systematic retrospective review of e-prescriptions received in inpatient pharmacy for dispensing in a multidisciplinary tertiary care hospital.

**Dispensing Setting:** In order to decrease medication administration error, the hospital works on Unit Dose Dispensing System, all the orders are segregated by Health Management Information Software and appeared on inpatient pharmacist window for dispensing, the inpatient pharmacist then check all the medication order, if the pharmacist find any medication error or better alternative, the pharmacist contact the concerned physician and discuss about the error and suggest alternatives, if the physician find the suggestion beneficial for the patient then the order is intervened.

**Date Collection:** These interventions were recorded by in-patient pharmacists from June 2014 till May 2015, which were then filled in a performa and categorized for potential of harm if not intervened.

**Result:** A total of 1336 interventions are accepted during the study period. About 83.2% of the interventions were found to be minor or moderately harmful. Most significant intervention was related to dose correction (26.9%), followed by drug alternatives (therapeutic or brand alternative) (26.6%), wrong frequency of drug (20.7%), excessive duration (9.2%), drug duplication (6.2%), culture and sensitivity based drugs (2.3%), wrong choice of drug (1.9%), wrong route (0.7%), wrong dosage form (0.7%), Addition of drug (0.2%) and drug-drug interactions (0.1%).

**Conclusion:** This study shows that concurrent evaluation of prescription by pharmacist decreases preventable medication errors which probably decrease health care cost and decrease patient hospital stay.

**Keywords:** Physician order entry, Drug dispensing, Inpatient pharmacy, Patient oriented care, Pharmaceutical intervention.

## BACKGROUND

The role of the pharmacist has been recognized all over the world in providing patient focused care [1]. Participation of pharmacist in clinical rounds, reviewing patients medical records, reconciliation of medication, and patient counselling about medications on discharge and follow up results in improve clinical outcomes [2], decrease mortality rates [3] and reduces preventable adverse drug reactions [4].

But in developing countries like Pakistan, the doctor of pharmacy program is more industry oriented than hospital or patient care oriented [5] and there are very few institutions who train pharmacist for clinical services that's why hospital or clinical pharmacist struggles to play their role in patient care. This is a reason why hospital or community pharmacy in

Pakistan is miserable with few qualified pharmacist in hospital and community pharmacy settings [6, 7]. Though pharmacy services are evolving but instead of current pharmacy evolution in Pakistan, pharmacist in hospital and community are more engaged with inventory management [8], with the exception of few hospitals where pharmacist is the integral part of patient focused care.

The knowledge of medication errors is essential prerequisite for better patient care, these medication error remains unnoticed in majority of health care centres of Pakistan due to manual or semi electronic prescribing system [9]. These errors can be minimize by pharmacy interventions that are thought to be the integral part of recent pharmacy services inspiring the standard of care and prevent major organ damage and potential life threatening conditions [10] and are known to decrease the patient medication cost contribute in rationalization of medication therapy [11], medicine

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adherence [12]. and significantly decreases the mortality rate [13] but there is very limited data available from Pakistan.

## OBJECTIVE

This study aims to document different pharmaceutical interventions that took place during dispensing through Computerized Physician Order Entry (CPOE) to prevent medication error at a multidisciplinary tertiary care hospital in Karachi, Pakistan.

## METHODOLOGY

### Study Design

Systematic retrospective review of e-prescriptions received in inpatient pharmacy for dispensing.

### Study Setting & Target Population

The study is conducted in a multidisciplinary tertiary care facility situated in Korangi, having 150 beds reserved for inpatient settings, six beds are reserved for emergency and six for day care. The dispensing is done through computerized physician order entry with Institutional Health Management Information Software (HMIS).

### Study Period

Though the concurrent evaluation of prescription is continuous process but the interventions which had done from June 2014 till May 2015 during unit dose dispensing by inpatient pharmacist, are included. The data of unit solar year is chosen so it covers all the seasons.

### Sample Size

All prescriptions meeting inclusion and exclusion criteria.

### Sampling Selection

#### *Inclusion Criteria*

Interventions done by inpatient pharmacist during dispensing through CPOE.

#### *Exclusion Criteria*

Interventions done by clinical pharmacist, antibiotic stewardship team, infection control team or intervention during dispensing in emergency pharmacy and OPD, or interventions done in other campuses of the hospital were excluded.

### Data Collection Procedure

In order to decrease medication administration error, the hospital works on unit dose dispensing system, all the orders are segregated by HMIS and appeared on trained inpatient pharmacist window for dispensing. The inpatient pharmacist then check all the medication order, if the pharmacist find any medication error or better alternative, the pharmacist contact

the concerned physician and discuss about the error and suggest alternatives. If the physician find the suggestion beneficial for the patient then the order is intervened.

During the study period, all inpatient pharmacists were instructed to save pharmacy interventions. Data of All interventions were then filled in performa manually by pharmacist and trainee pharmacist. These interventions were then sorted by senior clinical pharmacist for potential of harm that can be caused if not intervened.

- Minor will be those that do not harm the patient and need monitoring.
- Moderate will be those that can cause a temporary harm if used.
- Major will be those that can result in permanent harm to any organ, near-death or death.

## Ethical Consideration

All ethical aspects concerning the study were observed.

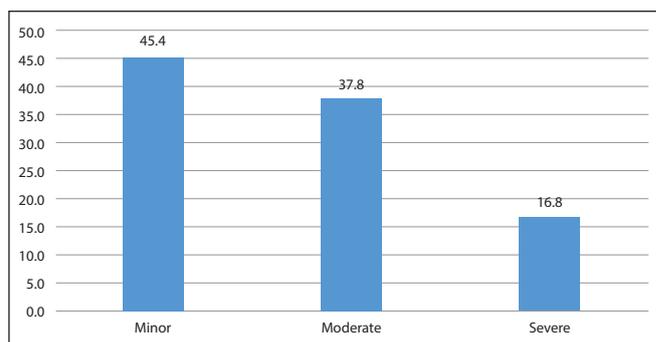
## Statistical Analysis

The data is first entered in MS excel then in SPSS ver. 20 for statistical analysis.

## RESULT

### Demography

More number of interventions are concerned with adults (21 years or above) about 65.3 % followed by children (2 months – 12 year) 18% and adolescent (13 year – 20 Year) 9.1%. interventions related to infants (7.6%) and new-borns (0.2%) were very minimum. 60 % of total Interventions were done on prescriptions of male patients while 40% were female. The paediatric age group is referred from Pediatric Expertise for Advisory Panels; Guidance for Industry and FDA Staff [14].



**Fig. (1).** Potential Harm of Medication Error.

## TYPES OF MEDICATION ERROR AND THEIR SEVERITY

A total of 1336 Interventions were accepted during the study period. But only 16.8% was found to be sever if not intervened and 83.2 % were found to be minor or moderately

**Table 1.** Types of Medication Error and their Potential Harm.

	Minor	Moderate	Severe	Total
Non-Renal Adjusted Dose	2	24	32	58
Wrong Dosage Form	8	1	1	10
Excessive Duration of then Required	17	70	36	123
Wrong Drug	7	15	4	26
Wrong Route	7	1	1	9
Drug Alternative / Substitute	356	0	0	356
Drug Duplication	8	55	20	83
Addition Of Drug	2	1	0	3
Culture and Sensitivity Based Drug	1	9	21	31
Wrong Dose	95	190	74	359
Wrong Frequency	102	139	35	276
Drug-Drug Interaction	2	0	0	2
Total	607	505	224	1336

harmful as shown in Fig. (1). The major area of intervention related to dose correction were about 26.9% (359), and found to be moderately harmful if not intervened. Switching to alternative drug (pharmaceutical alternative 4.7%, therapeutic alternative 20.3%) to adhere the physicians to hospital drug formulary, and to reduce cost was found to be 26.6% (356), followed by wrong frequency (20.7%). Excessive duration (9.2%), drug duplication (6.2%), renal adjusted dose (4.3%), culture and sensitivity based drug (2.3%), wrong drug entered in notes (1.9), wrong dosage form (0.7%), wrong route of administration (0.3%) addition of drug (0.2%) and drug-drug interaction (0.1%) as shown in (Table 1).

#### TYPES OF PHARMACEUTICAL INTERVENTION

All interventions are divided into four categories as shown in Table 2. A total of 568 (42.5%) interventions were related to change in drug or the dosage form of the drug. While 399 (29.9%) interventions brought change in dose either by increasing due to sub-therapeutic dose (11.4% of total) or decreasing (18.7%) due to renal adjustment or supra-therapeutic dose, followed by wrong frequency (282) (21.1%) and drug stop due to duration or any other reason (87) (6.5%).

**Table 2.** Types of Pharmaceutical Intervention.

	Frequency	Percent	Valid Percent	Cumulative Percent
Drug Stop Due to any Reason	87	6.5	6.5	6.5
Change in Dosing Frequency	282	21.1	21.1	27.6
Change in Dose	399	29.9	29.9	57.5
Change or Addition of Drug	568	42.5	42.5	100.0
Total	1336	100.0	100.0	

#### DISCUSSION

This study shows that pharmacy intervention prevent drug related harm. Though most of the interventions are found to be minor or moderately harmful if not intervened but it surely save cost of therapy and enhance quality of care as shown in studies [15, 16]. This study focuses the role of inpatient dispensing pharmacist in Pakistan though there are number of studies published which elaborate the role of clinical pharmacist [17, 18] and community pharmacist [19, 20]. The high rate of accepted pharmacy intervention (111.3 interventions / month) shows the role of inpatient dispensing

pharmacist in providing quality and patient focused care. Most of the intervention are related to adult patients (65.3%) because less numbers of beds are reserved for paediatric patients. Since the hospital work with computerized physician order entry CPOE and computerized dispensing so, it is expected to have less medication error and more interventions [21]. The census 2017 shows that Pakistan has more males than female, that could be a reason for male dominance in this study as well [22].

Most of the interventions presented minor (45.4%) or moderate harm (37.8) while only 16.8% was found to be severe if not intervened which is just similar to the study done by HAM Al Rhab *et al.* [23] The major interventions are concerned with inappropriate dose which supports the study done in Australian teaching hospital having 43.6% of interventions concerned with high doses [24]. The importance of this study can be realized by the data obtained having 70.8% interventions prevent toxicity (35.3%) and rationalize the treatment (35.5%).

We recommend future researches on the cost saved by inpatient pharmacist during unit dose dispensing through CPOE, we also recommend further research on different factor which contribute in the success of any pharmacy intervention. Though this study shows the role of pharmacist in providing quality care, still we feel that pharmacist role in Pakistan is very limited. Therefore, we recommend a proper training or residency program for pharmacist.

### LIMITATIONS

We hadn't recorded the interventions which were rejected by Primary Physician that's why we were unable to calculate the acceptance rate as done by Barber *et al.* [25]. Similarly we haven't analysed the no. of minutes spent on these Intervention as calculated by Hawkey *et al.* [26].

### CONCLUSION

This study shows that concurrent evaluation of prescription by pharmacist decrease preventable medication errors. A total of 1336 interventions shows the crucial role of pharmacist in providing quality care but a proper national guidelines and training for inpatient and clinical pharmacist can improve the health care standard all over Pakistan. Because these interventions and pharmacy evaluation of prescriptions play a crucial role to prevent drug related harm. Continuous pharmacist review also improves the hospital prescribing practise because inpatient pharmacist is in position to educate health care practitioners about drugs.

### CONTRIBUTION OF AUTHORS

Hassan Raza and Yasmin Akhtar conceived and designed the study. Both the authors have equally contributed in collection and analysis of data. Hassan Raza has wrote the paper while Yasmin Akhtar has reviewed it and have made changes.

authorship must be limited to both.

### CONFLICT OF INTEREST

Declared none.

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